

Algebra and Functions – Some Experiments

1. Use a calibrated thermometer - read from it several points in Fahrenheit and Celsius. Plot a conversion graph and from it find the formula connecting these measures. Compare your equation to the known formula.
(Explain the meaning of any points of intersection with the axes and any other interesting features. Discuss the accuracy of your graph and any errors involved. Change the subject of the formula. Substitute different values which could be of interest. Check these values.)
2. Drop a ball from a known height and measure the height of the first bounce. Repeat for different starting heights. Plot a graph between the two heights and find an equation that connects them.
3. Hang a weight at the end of a piece of string of measured length. Suspend the string from the other end and allow the weight to hang free. Pull the weight out from the vertical keeping the string taut and release. Time the period of oscillation from one extreme point in the oscillation until the weight returns to that same position. (It may be necessary to repeat this measure and an average result taken.) Repeat with different lengths of string. Plot a graph between the period of oscillation and the length of the string and find an equation that connects them.
4. Balance a rule about its centre so that it is horizontal. Place a fixed weight at one end and achieve the balance again by means of a second known weight placed at a measured distance from the balance point. Repeat with different second weights noting each time the distance from the balance point required to keep the rule balanced. Plot a graph between the distance and the second weight and find its equation.
5. Hang a piece of elastic from a fixed point. Measure its length. Place known weights at the free end and measure the extension produced. Plot a graph between weight and extension and find its equation.
6. Tilt the surface of a table a little so that a small ball, such as a marble, will slowly roll down it. On a sheet of paper mark 10 or so parallel lines 10 cm apart and fix the paper to the inclined table along its line of greatest slope. Release the ball at the top mark and note the time as the ball passes each line. Plot a graph between the distance and the time.
7. Fill a container with hot water. Note the room temperature. Take the temperature of the water at about 5 minute intervals and note the difference from room temperature. Plot a graph between the temperature difference and the time. From your graph calculate the gradient, the rate of cooling, at different temperature differences and plot a second graph between the rate of cooling and the temperature difference.

